THE INVENTION CLAIMED IS:

1. A particle collection apparatus for removing particles from input air that is directed into said apparatus, comprising:

a chamber into which a flow of said input air can be directed;

at least one nozzle for spraying a liquid, said liquid becoming separated into a plurality of electrically charged droplets upon exiting said at least one nozzle, wherein said electrically charged droplets are directed into said chamber and said chamber is configured to cause said flow of input air and said electrically charged droplets to intermix; whereby said plurality of electrically charged liquid droplets remove at least a portion of said plurality of particles from said input air, thereby collecting a plurality of said particles from said input air;

a collecting surface for collecting said liquid sprayed from said nozzle subsequent to said liquid intermixing with said input air in said chamber; and

wherein said plurality of charged liquid droplets collected at said collecting surface are aggregated into a volume of liquid which contains said collected particles;

wherein said aggregated volume of liquid is re-circulated through said at least one nozzle and said chamber, whereby the concentration of particles collected from said input air can increase over time as said particle collection apparatus is operated.

2. The particle collection apparatus as recited in claim 1, wherein said particle concentration within said liquid actually increases over a time interval, even if a concentration of said particles in said input air does not increase over said time interval.

3. The particle collection apparatus as recited in claim 1, wherein said plurality of particles is a plurality of aerosol particles.

4. The particle collection apparatus as recited in claim 3, wherein said aerosol particles are comprised of particulate matter and fluorescent markers.

5. The particle collection apparatus as recited in claim 1, further comprising an analysis station that detects at least one predetermined type of particle of said plurality of collected particles.

6. The particle collection apparatus as recited in claim 3, wherein said analysis

station operates in a continuous mode so as to detect a substantially sudden increase in a concentration of said at least one predetermined type of particle.

7. The particle collection apparatus as recited in claim 5, wherein said analysis station operates in a continuous mode so as to detect a gradual increase in a concentration of said at least one predetermined type of particle when said concentration reaches a level of substantially minimum detectability of said analysis station.

8. The particle collection apparatus as recited in claim 5, further comprising a collecting station; wherein said analysis station operates in a batch mode and, at appropriate intervals, directs said liquid containing said plurality of collected particles to said collecting station while simultaneously introducing unused liquid to said at least one nozzle to replace said liquid that has been directed to said collecting station.

9. The particle collection apparatus as recited in claim 8, wherein said collecting station performs a more detailed analysis on said at least one predetermined type of particle.

10. The particle collection apparatus as recited in claim 5, wherein said at least one predetermined type of particle comprises at least one of: (a) a biological organism; (b) a pathogenic compound; (c) a toxic compound; (d) a spore; and (e) a radioactive isotope.

11. The particle collection apparatus as recited in claim 5, wherein said analysis station comprises at least one of: (a) a light-scattering sensor; (b) a turbidity sensor; (c) a radioactivity sensor; (d) a spectraphotometric-type sensor detecting electromagnetic energy absorption; and (e) a spectraphotometric-type sensor detecting electromagnetic energy emission.

12. The particle collection apparatus as recited in claïm 11, wherein said spectraphotometric-type sensor detects a fluorescent marker that is contained within said re-circulated liquid, which fluorescent marker is attracted to a predetermined type of biological organism of said at least one predetermined type of particle.

13. A particle collection apparatus, comprising:

a chamber into which a flow of input air is directed, said input air containing a plurality of particles;

at least one nozzle through which a liquid is sprayed into said chamber, said liquid becoming separated into a plurality of electrically charged droplets upon exiting said at least one nozzle;

a collection surface; and

said chamber being configured to cause said flow of input air and said charged liquid droplets to intermix within said chamber, wherein said plurality of particles are attracted to said plurality of charged liquid droplets which remove a portion of said plurality of particles from said input air, thereby forming a plurality of collected particles within said charged liquid droplets, said plurality of charged liquid droplets being collected at said collecting surface and thereby aggregating into a volume of liquid which contains said plurality of collected particles; and

an analysis station to which said aggregated liquid is directed.

14. The particle collection apparatus as recited in claim 13, wherein said analysis station includes a sensor designed to detect at least one predetermined type of particle of said plurality of collected particles.

15. The particle collection apparatus as recited in claim 13, wherein said plurality of particles is a plurality of aerosol particles.

16. The particle collection apparatus as recited in claim 13, wherein said analysis station is located within a closed-loop of said liquid, and operates in a continuous mode so as to detect one of: (a) a substantially sudden increase in a concentration of said at least one predetermined type of particle, and (b) a gradual increase in a concentration of said at least one predetermined type of particle when said concentration reaches a level of substantially minimum detectability of said analysis station.

17. The particle collection apparatus as recited in claim 13, wherein said analysis station is located external to a path of said liquid and the apparatus operates in a batch mode such that, as desired, said liquid containing said plurality of collected particles is directed to said analysis station while simultaneously introducing unused liquid to said at least one nozzle to replace said liquid that has been directed to said analysis station.

18. The particle collection apparatus as recited in claim 14, wherein said at least one predetermined type of particle comprises at least one of: (a) a biological organism; (b) a

pathogenic compound; (c) a toxic compound; (d) a spore; and (e) a radioactive isotope.

19. The particle collection apparatus as recited in claim 14, wherein said sensor comprises at least one of a type: (a) light-scattering; (b) turbidity; (c) radioactivity; (d) spectraphotometric absorption; and (e) spectraphotometric emission.

20. An aerosol particle collection apparatus, comprising:

a chamber into which a flow of input air is directed, said input air containing a plurality of aerosol particles;

at least one nozzle through which a liquid is sprayed into said chamber, said liquid becoming separated into a plurality of electrically charged droplets upon exiting said at least one nozzle;

a collecting surface; and

said chamber being configured to cause said flow of input air and said charged liquid droplets to intermix within said chamber, wherein said plurality of aerosol particles are attracted to said plurality of charged liquid droplets which remove a portion of said plurality of aerosol particles from said input air, thereby forming a plurality of collected aerosol particles within said charged liquid droplets, said plurality of charged liquid droplets being collected at said collecting surface and thereby aggregating into a volume of liquid which contains said plurality of collected aerosol particles;

wherein said liquid is re-circulated through said at least one nozzle and said chamber, and wherein said plurality of collected aerosol particles become increasingly concentrated within said liquid over time as said particle collection apparatus is operated.

21. The particle collection apparatus as recited in claim 20, wherein said aerosol particles are comprised of particulate matter and fluorescent markers.

22. The aerosol particle collection apparatus as recited in claim 20, wherein said aerosol particle concentration within said liquid actually increases over a time interval, even if a concentration of said aerosol particles in said input air does not increase over said time interval.

23. A method for collecting particles entrained in air, said method comprising:

providing a chamber into which a flow of input air is directed, said input air containing a plurality of particles;

providing at least one nozzle, spraying a liquid therethrough and into said chamber, said liquid becoming separated into a plurality of electrically charged droplets upon exiting said at least one nozzle;

intermixing said input air and said charged liquid droplets within said chamber, wherein said plurality of particles are attracted to said plurality of charged liquid droplets, and thereby removing a portion of said plurality of particles from said input air to form a plurality of collected particles within said charged liquid droplets;

collecting said plurality of charged liquid droplets at a collecting surface and aggregating them into a volume of liquid which contains said plurality of collected particles; and

directing said liquid with said plurality of collected particles to an analysis station that detects at least one predetermined type of particle of said plurality of collected particles.

24. The method as recited in claim 23, wherein said plurality of particles is a plurality of aerosol particles.

25. The method as recited in claim 23, wherein said liquid is directed through one of: (a) a closed-loop pathway, wherein said analysis station is located along said closed-loop pathway, and wherein a first particle concentration of said at least one predetermined type of particle within said liquid increases over time, even if a second concentration of said particles in said input air does not increase; and (b) an open-loop pathway to a batch collection station, wherein said analysis station is located at said batch collection station.

26. The method as recited in claim 23, wherein said at least one predetermined type of particle comprises at least one of: (a) a biological organism; (b) a pathogenic compound; (c) a toxic compound; (d) a spore; and (e) a radioactive isotope.

27. The method as recited in claim 23, wherein said analysis station comprises a one sensor of at least one of a type: (a) light-scattering; (b) turbidity; (c) radioactivity; (d) spectraphotometric absorption; and (e) spectraphotometric emission.